

Claim Amendments

Claims 21, 28 and 35 are amended to more clearly define the claimed invention. Support for the noted amendments resides at page 7, lines 1-11 of the specification. No new matter is added by this amendment.

Applicants' Invention

Applicants' invention is directed to A method of forming an orientation film on a substrate comprising:

providing a substrate on a stage, said substrate facing downwardly from a bottom-facing surface of said stage;

positioning a slit coater having a slit nozzle adjacent to and spaced from the substrate a distance corresponding to the desired thickness of said orientation film ; and

spraying an orientation material having a surface tension on the substrate through the slit nozzle of the slit coater while maintaining the surface tension of the orientation material, said orientation material being coated on said stage at a speed which maintains said surface tension. An orientation pattern may also be provided on the orientation material.

Applicants' invention is neither disclosed nor suggested by the prior art.

Rejection of Claims 21, 23 and 35 under 35 USC 103(a)

Claims 21, 23 and 35 stand rejected under 35 USC 103(a) as being unpatentable over Sago et al U.S. Patent No. 6,436,472.

In support of the rejection, the Examiner takes the position that “canceling out or minimizing the effects of surface tension [as allegedly taught by the reference] suggests maintaining the surface tension”, and that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to maintain surface tension of an orientation material for uniform distribution of the material onto a substrate”. This rejection respectfully is traversed.

Sago et al is directed to a method of applying a coating solution to a substrate surface using a rotary coater. In the disclosed method, a slit nozzle is positioned above an end of a glass substrate placed in an inner cup. While a coating solution is being ejected with reduced surface tension from the slit nozzle toward the glass substrate, the slit nozzle is translated parallel to the surface of the glass substrate to coat the coating solution on the glass substrate.

The reference teaches that the surface tension of the applied coating should be “minimized or reduced” during application of the coating to the substrate material. The Examiner’s attention is directed to column 2, lines 26-29 and 59-65; column 4, lines 44-58; and column 5, lines 6-15 of the reference for a discussion of the method by which the surface tension of the coating is *reduced or minimized* during the coating step.

The above teachings of the reference are in direct contrast to and inconsistent with the limitation of applicants' independent claims of "spraying an orientation material having a surface tension on the substrate through the slit nozzle of the slit coater *while maintaining the surface tension of the orientation material*". The Examiner's attention is also directed to the discussion of surface tension of the coating material in applicants' specification at the paragraph bridging pages 6 and 7 of the specification.

By way of further distinction, in Sago, the surface tension results from the solution and the slit nozzle. The surface tension should thus be reduced to coat the solution from the slit nozzle onto the substrate. However, in the claimed invention, the surface tension is formed because the orientation material (solution) contacts not only the slit nozzle but also the substrate. Thus, the surface tension should be uniformly maintained so as to coat the orientation material.

Also, as shown in Figure 2 of the present invention, the substrate is turned upside down, and the slit coater is arranged under the substrate. The slit nozzle is disposed at the upper part of the slit coater during the coating process. Therefore, as stated above, the orientation material should contact the substrate, and the surface tension should be uniform.

Claims 21, 28 and 35 are amended in an attempt to more clearly distinguish over the claimed invention. The claims now provide that "substrate faces downwardly from a bottom-facing surface of the stage"; and the "orientation material is coated on the stage at

a speed which maintains the surface tension”. The Sago reference is silent with respect to both of these points.

In view of the above, the claimed invention is not anticipated by the cited reference and the rejection should be withdrawn.

Rejection of Claims 22 and 36 under 35 USC 103(a)

Claims 22 and 36 stand rejected under 35 USC 103(a) as being unpatentable over Sago in view of Matsuda et al ‘822. This rejection respectfully is traversed

The deficiencies of Sago are discussed above. The additional citation of Matsuda does not cure the deficiencies of Sago.

Matsuda is cited to teach the thickness of the orientation material. However, the reference is otherwise silent regarding the method steps of the independent claims. In view of the deficiencies of Sago, and the failure of Matsuda to cure same, the rejection is without basis and should be withdrawn.

Rejection of Claims 24-31 and 37-38 under 35 USC 103(a)

Claims 24-31 and 37-38 stand rejected under 35 USC 103(a) as being unpatentable over Sago in view of Takahashi et al ‘851. This rejection respectfully is traversed

The deficiencies of Sago are discussed above. The Examiner notes that Sago does not teach the use of laser patterning. The additional citation of Takahashi does not cure the deficiencies of Sago.

Takahashi is cited to teach the use of laser patterning a pattern on a resist film. However, the reference is otherwise silent regarding the method steps of the independent claims. In view of the deficiencies of Sago, and the failure of Takahashi to cure same, the rejection is without basis and should be withdrawn.

Rejection of Claims 32-34 under 35 USC 103(a)

Claims 32-34 stand rejected under 35 USC 103(a) as being unpatentable over Sago in view of Takahashi et al '851 and Matsuda et al '822. This rejection respectfully is traversed

The deficiencies of Sago are discussed above. The Examiner admits that Sago does not appear to teach the steps of spraying, rubbing and rubbing after forming an orientation pattern. The additional citation of Matsuda does not cure the deficiencies of Sago.

Matsuda is cited to teach the noted sequence of steps. However, as discussed above, the reference is otherwise silent regarding the method steps of the independent claims. In view of the deficiencies of Sago, and the failure of Matsuda to cure same, the rejection is without basis and should be withdrawn.

In view of the above, the rejection is without basis and should be withdrawn.

The application is now believed to be in condition for allowance and an early indication of same is earnestly solicited.

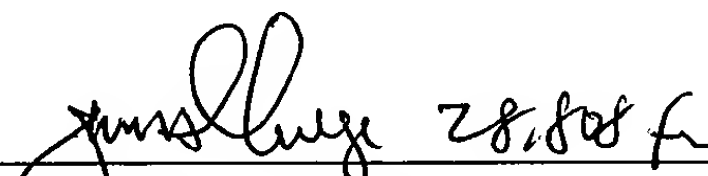
In the event that any outstanding matters remain in this application, Applicants request that the Examiner contact James W. Hellwege (Reg. No. 28,808) at (703) 205-8000 to discuss such matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Very truly yours,

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MARKED UP COPY OF CLAIM AMENDMENTS

The claims are amended as follows:

21. (Amended) A method of forming an orientation film on a substrate comprising:

providing a substrate on a stage, said substrate facing downwardly from a bottom-facing surface of said stage;

positioning a slit coater having a slit nozzle [on] adjacent to and spaced from the substrate a distance corresponding to the desired thickness of said orientation film ; and

spraying an orientation material having a surface tension on the substrate through the slit nozzle of the slit coater while maintaining the surface tension of the orientation material, said orientation material being coated on said stage at a speed which maintains said surface tension .

28. (Amended) A method of forming an orientation film on a substrate comprising:

providing the substrate on a stage, said substrate facing downwardly from a bottom-facing surface of said stage;

positioning a slit coater having a slit nozzle [on] adjacent to and spaced from the substrate a distance corresponding to the desired thickness of said orientation film

spraying an orientation material having a surface tension on the substrate through the slit nozzle of the slit coater while maintaining the surface tension of the orientation material, said orientation material being coated on said stage at a speed which maintains said surface tension; and

patterning an orientation pattern at a predetermined portion of the orientation material.

35. (Amended) A method of forming an orientation film on a substrate, comprising:

providing the substrate on a stage, said substrate facing downwardly from a bottom-facing surface of said stage;

positioning a slit coater having a slit nozzle and an orientation material, the slit nozzle being at a predetermined distance from the substrate, and

spraying the orientation material having a surface tension on the substrate through the slit nozzle of the slit coater while maintaining the surface tension of the orientation material, said orientation material being coated on said stage at a speed which maintains said surface tension.